# Measuring What Social Partners Do about Wages over the Business Cycle

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19 December 2019

*Abstract:* Collective bargaining (CB) conducted by trade unions and employer associations (the social partners) plays a key role in the formation of wages in many countries, with potential interactions. This paper investigates the potential interactions of CB with the macroeconomy by estimating the business cycle sensitivity of the many thousands of CB minimum wages. Drawing on matched worker- and CB data covering all employees in Portugal, we find that, over the 1982-2017 period, CB real wages are no more than 0.7 percent lower when the unemployment rate increases by one percentage point. This is less than half the equivalent entry-level effect (1.8) documented in Martins, Solon and Thomas (2012). Moreover, much of the sensitivity of CB wages is driven by the high-inflation period until 1992, with effects as large as 5.2. Overall, our findings of limited CB real wage cyclicality suggest that, in Portugal (and possibly also in other countries in Southern Europe), the social partners may not yet have fully adjusted to the macroeconomic regime of Eurozone membership.

*Keywords:* Wage Rigidity, Inflation, Unemployment, Euro, Collective bargaining

*JEL codes:* E24, E32, J31, J64

The author thanks Claudio Lucifora, Maria Olsson and Gary Solon for comments, Joana Saraiva for research assistance, the Ministry of Employment of Portugal for data access, and the Gulbenkian Foundation and the European Commission (CoBExt action, grant VS/2016/0340) for financial support. The usual disclaimer applies.
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## I. Introduction

In many countries around the world, large shares of their workforces have their wages shaped at the firm-, sectoral- or national-level, in the context of collective bargaining between firms and their representatives (employers' associations) and workers and their representatives (trade unions).[1] These two types of representatives or economic agents, sometimes referred to as 'social partners', can therefore play an important role in shaping the economic performance of their countries.

This form of wage determination involving social partners may also represent an important departure from the context of search and matching models (Mortensen and Pissarides, 1994) in which wages are determined in an individualised manner, within worker/employer matches, and through Nash bargaining. In contrast, the collective bargaining process, particularly at the sectoral- or national-level, involves a collective form of wage determination, stemming from some form of aggregation of heterogenous outside options and bargaining power levels. Moreover, the Nash bargaining assumption tends to generate significant procyclicality in real wages and much smaller cyclical fluctuations in unemployment than actually occur (Shimer, 2005).[2]

In contrast, in a collective bargaining context, while individual wages can surpass (and, in some specific cases, undercut) collective bargaining (minimum) wages, the latter can be critical forces in shaping overall wage developments over the business cycle. More specifically, collective bargaining (and its implicit contracts and insurance mechanisms)

[1] According to OECD (2019), on average, across OECD member countries, 32% of all workers were covered by collective agreements in 2017. In South-western Europe (France, Italy, Spain and Portugal), this share increases to over 85%.

[2] Indeed, a number of studies including Gertler and Trigari (2009) and Kennan (2010) have suggested including stickiness in real hiring wages as a way of modifying the Mortensen-Pissarides model to generate realistically large quantity fluctuations.

can introduce substantial rigidity in the wage determination process at all job levels, including entry positions, in contrast to the potential volatility driven by Nash bargaining in individualized bargaining.

This paper contributes empirical evidence to the macroeconomic debate about wage rigidity, ongoing at least since Keynes (1936) and including Barro (1977), Bewley (1999) and many other contributions. Here we focus on the potentially limited cyclical variability of collective bargaining wages and its role in the cyclical volatility of employment and unemployment. Specifically, we investigate the extent to which collective bargaining real wages respond to the business cycle, as proxied by the unemployment rate. Our approach thus complements the existing literature focused on hiring wages (Hall and Milgrom, 2008; Pissarides, 2009) which tends to find that these are quite procyclical (Carneiro et al, 2012, Martins et al, 2012).[3] To the best of our knowledge, this is the first paper that examines what we label here as 'collective bargaining real wage cyclicality'.[4]

A second motivation for our study complementary to the macroeconomic debate above concerns the specific case of Southern Europe. The relatively weak economic performance over the last 20 years of countries such as Greece, Italy, and Portugal (as well as France and Spain to a lesser extent) may be related to an incomplete modernization of the political and economic institutions in these countries towards the new macroeconomic

[3] There is also a great deal of evidence on real wage cyclicality in general. For example, using 1967-1987 data, Solon et al (1994) estimated that a one percentage point increase in the unemployment rate is associated with a 1.2 percent reduction in real wages. Several other studies using longitudinal microdata from the United States and elsewhere have produced similar results (e.g. Bils, 1985; Beaudry and DiNardo, 1991; Devereux and Hart, 2006; Martins, 2007).

[4] See Gartner et al (2013) for an analysis of real wage cyclicality under different collective bargaining settings in Germany. In contrast to our approach, Gartner et al (2013) consider individuals' total wages and not the collective bargaining wages per se. See also Björklund et al (2019) for an analysis of the duration and renewal of collective agreements in Sweden. See Rosolia (2014) for the case of Italy from the perspective of Phillips curves, considering 20 sectoral agreements and a sample of firms.

regime of low inflation, a fixed exchange rate, and low interest rates that followed from Eurozone membership.[5]

A potentially important component of these institutions is precisely collective bargaining and, more broadly, 'social dialogue' or even 'tripartite dialogue', the latter involving both trade union and employer confederations and the government. In this context, examining collective bargaining real wage cyclicality across the Eurozone, both before and after the adoption of its regime, as we do in this study, can offer important, policy-relevant insights (Blanchard et al, 2014).

The lack of evidence on collective bargaining real wage cyclicality is related to the limited availability of data on collective bargaining wages, in particular over long periods of time. We overcome this constraint by considering the case of Portugal, for which we use matched worker- and collective-agreement data covering all (private-sector) individual employees between 1982 and 2017. Using this large data set, corresponding to over 67 million individual-year observations, we compute modal wages per each collective-agreement/job-category/year combination as our proxy for collective bargaining minimum wages, following Cardoso and Portugal (2005). We then regress the real values of these minimum wages (about 30,000 different values per year (Martins, 2019)) on the unemployment rate of the year in which they were in force to estimate our measure of collective bargaining real wage cyclicality.

We find that, on average, over the 1982-2017 period, collective bargaining real wages are acyclical in several specifications. Moreover, in general, these real wages are no more than 0.7 percent lower when the unemployment rate increases by one percentage

[5] See Braga de Macedo (2001) for an informed discussion of the steps towards Eurozone membership in Portugal.

point. This is less than half the effect (1.8) documented in Martins et al (2012) when focusing on entry-level jobs in Portugal using the same data set. We also find that much of the limited sensitivity of collective bargaining wages that we find is driven by the high-inflation period until 1992 (when the macroeconomic regime change began), with effects as high as 5.2. Overall, our findings suggest that collective bargaining in Portugal has not yet adjusted fully to Eurozone membership, in the sense that collective bargaining minimum wages exhibit a very limited degree of responsiveness to the business cycle, potentially exacerbating employment fluctuations during downturns.

Section II discusses the role of collective bargaining upon wage formation, with a focus on the case of Portugal. In section III, we present the data set that we use and several descriptive statistics. Section IV presents our main findings about collective bargaining real wage cyclicality. Finally, in section V, we briefly summarize our findings and discuss some of their implications.

## II. Collective bargaining and wage formation

Collective bargaining concerns the dialogue and discussions established between firms and their representatives, on the one hand, and multiple workers and their representatives, on the other hand, regarding wages and other working conditions (holidays, overtime premia, health and safety, training, etc.). When employment relationships are longer-lasting and firm-specific skills more relevant, the premises of spot markets do no longer apply: gaps or wedges will emerge between the outside options of each party and their productivity and wages. Bargaining will therefore become more

relevant. It can also be conducted individually (between one firm and one worker) and or in groups.

The latter case, of collective bargaining, is seen in many countries, in particular in Continental Europe, as a way to promote social dialogue, leading to more harmonious industrial relations, economies and even societies, with higher levels of productivity (Martins, 2019b) and wages and fewer instances of industrial conflict. The distribution of income between labour and capital and within labour itself may become more balanced as well. Those countries have thus introduced several regulations and procedures to shape collective bargaining in particular directions, with potentially significant effects on wage formation, including over the business cycle.

In the particular case of Portugal (and similarly to several Southern European countries), a number of CB or related regulations should be taken into account in this context (see also Hijzen et al, 2019). First, employment protection law is relatively restrictive as far as open-ended contracts are concerned. Nominal base wages also cannot legally be cut in ongoing employment contracts except in exceptional circumstances. This strengthens the bargaining power of employees under open-ended contracts and may increase downward nominal wage rigidity.[6]

Second, sectoral collective agreements (by far the most common type of agreement) are virtually automatically extended to all workers in the relevant sector (and region, if applicable) through administrative decisions (Martins, 2019a). This practice creates an important wedge between trade union density and CB coverage, sometimes of 80% or more of total employment, as in the case of France, and of about 50% of total employment in the

[6] Moreover, until 2004, according to employment law, collective agreements could not be terminated unilaterally in a number of cases. This may have further strengthened the bargaining power of employees.

case of Portugal (OECD, 2019), except in the period 2011-2015 (Hijzen and Martins, 2016). Moreover, there is little flexibility in employment law for firms to deviate downwards from CB wages when such firms are suffering from negative demand schocks.

Third, similarly to the case of statutory minimum wages, CB wages function as wage floors, with employers commonly paying wages above those levels (Cardoso and Portugal, 2005). However, such CB wages can function as reference or even focal points in the hiring of new workers or upon the promotion of existing workers to a higher job category. Moreover, while collective agreements include many other clauses than those specifically about (minimum) wages, the former tend to add relatively little value compared to the already applicable regulations stemming from statutory employment law (Martins and Saraiva, 2019).

## III. Data and Descriptive Statistics

Our data come from 'Quadros de Pessoal' (Personnel Records), an annual mandatory census of all employers in Portugal (except most of the public sector) and all their employees. Employee information is available for every year between 1982 and 2017 (except 1990 and 2001). Employee information includes monthly nominal wages (base and total), hours of work (base and overtime), collective agreement and its job category that applies to each worker, and several other variables (age, gender, schooling, occupation, job level, hiring date, etc). The census takes March of each year as the reference month through 1993 and October from 1994 on. The data base suits our purposes very well: by

tracking each collective-agreement/job-category (simply agreement/job, henceforth) pair longitudinally, we can study how their wages vary over the business cycle.[7]

Our main measure of the collective bargaining minimum wage in each agreement/job/year combination is its modal value across all firms and workers. This approach was first adopted in Cardoso and Portugal (2005), which show a good correspondence between these modes and the actual collective bargaining minimum wages in a sample of agreements that they examine in greater detail. Our computation of the mode was also based on the real monthly wage of each worker (drawing on Statistics Portugal's monthly consumer price index) rounded to nearest 2017 euro. If a tie occurred, we selected the lowest value. The only restriction imposed in the construction of the sample was that the number of base hours worked in the reference month is of at least of 140, so to ensure that we examine full-time employees, the focus of collective bargaining minimum wages.

Table 1 describes the workers considered in each year and their average and modal wages. In the first column, we find that the annual number of employees ranges between 1.3 million in 1984 and 2.5 million in 2008. Average real wages peak in 2010 at 956 euros and have their lowest value in 1988 (706 euros). As to our modal (real) wages, they exhibit much less fluctuation over the period covered, ranging between 813 and 634 euros, in 1982 and 1989, respectively. Only in three years (other than 1982) are modal wages higher than 700 euros (1983, 2010 and 2017). All yearly wages, including the modes, are computed using as weights the number of workers in each agreement/job pair.

[7] In contrast, Martins et al (2012) is focused exclusively on entry-level jobs (Doeringer and Piore, 1971; Baker et al, 1994), defined as specific five-digit occupation codes at the same job level (hierarchy level) in each firm. To ensure their "port-of-entry" nature, the job must also account for at least three new hires (with up to four months of tenure) and at least 10 percent of the firm's new hires in at least half the years the firm is present in the data. None of restrictions above apply in the present paper, which is not focused on entry-level wages.

Even before taking into account the business cycle – as shown in Figure 1, Portugal's annual unemployment rate varied widely over the period, with peaks in the mid 1980's, mid 1990's, and mid 2010's –, this time series can already be regarded as indirect evidence of acyclical collective bargaining real wages. Note that the high real modal wages in the very first years of the series will be driven partially by composition effects stemming from higher levels of informality in the early 1980s and possibly imperfect compliance with the census at the time, particularly amongst firms in low-wage sectors. Another complementary explanation is the very steep increases in collective bargaining wages in the mid and late 1970s, following the 1974 revolution and the strong increase in trade union bargaining power at it generated. This bargaining power was however eventually eroded by the high levels of inflation (and, to a lesser extent, unemployment) in the early 1980s.

Table 2 examines the modal wages in different ways. Column 1 presents a count of the number of agreement/job pairs per year, showing that this number varies between around 26,000 in 1982 and 36,000 in 2016 (Martins, 2019). Columns 2 and 3 present an indication of the fit between such modal wages and the corresponding base or total wages of the corresponding workers (in the same agreement/job pair), averaged by year, using again the number of workers in each pair as weights. In the case of base wages, we find that the percentage of workers that are paid exactly the same (real) modal wage ranges between 19% in 2006 and 34% in both 2016 and 2017.

The latter cases may pick up the role of a very steeply increasing statutory minimum wage in those two years (which by law overrides the 'minimum minimorum' of the collective agreements if the latter is lower). However, the overall distribution of modal

'bites' across the 36-year period covered may be broadly consistent with the view that collective bargaining wages tend to be more pressing at times of higher unemployment.

An important exception to this pattern is 2013, when unemployment was particularly high but the collective bargaining bite dropped significantly. This outcome may have been influenced by the significant slowdown in the renewal of agreements and their non-automatic extension (Hijzen and Martins, 2016), implying that collective bargaining wages froze in a large percentage of cases. Automatic wage growth determined by tenure-related increments and dismissals or non-renewals of employment contracts of younger or less experienced workers (typically on lower wages) would also drive the drop in collective bargaining bite over that year.

If considering instead the mode of the total wage and, we find that its fit with the total wages of workers in each agreement/job pair is much lower than in the case of base wages. This indicates that total wages (base wages plus additional wage components such as overtime pay or bonuses) exhibit much greater dispersion within agreement/job cells.

Finally, we mention that the version of the data set used in our estimations described below has nearly one million observations (992,277), each corresponding to a particular agreement/job/year combination, representing an average of 68 workers. There is a total of 213,770 different agreement/job pairs and 2,186 different agreements. The number of different agreements per year increase from little above 400 in the early 1980s to over 800 in the late 2010s). We also find that each specific agreement/job pair is observed over ten years (weighted average).[8]

[8] This possibly relatively low number (in contrast to the 34 years covered in our data) may reflect several factors including the emergence of entire novel agreements (including at the firm level, complementing the more dominant sectoral agreements), the demise of old agreements, and also some degree of churning in ongoing collective agreements, for instance through the addition or exclusion of signatories which may lead

## IV. Results

Let $w_{jt}$ denote the collective bargaining real minimum wage applicable to workers in collective agreement and job level pair *j* in period *t*, corresponding to the modal base wages described above. Our empirical analysis is then based on the following statistical model for $w_{jt}$:

$$(1)\ log\ w_{jt} = \alpha_j + \beta UR_t + \epsilon_{jt},$$

where $\alpha_j$ is a set of fixed effects for each agreement/job pair, $UR_t$ is the unemployment rate of year *t*, and $\epsilon_{jt}$ indicates the zero-mean error term. Given the log-level specification adopted, β indicates the percentage change in a collective bargaining real minimum wage following a one percentage point increase in the unemployment rate.

We estimate this or adjusted versions of our model in the agreement/job/year data set described above (covering the entire period or different subsets) and present the coefficient (and standard error) of β in the different rows of Table 3. The first row shows the estimated coefficient of the unemployment rate when controlling for a linear time trend and using weighted least squares to weight for the number of workers in each agreement/job/year observation. In this benchmark estimate, we find a coefficient estimate of -0.15 (with an estimated standard error 0.13), indicating that there is not a significant relationship between the business cycle and CB wages. However, despite the lack of precision of the estimate, its confidence interval is not wide enough to reach cases of highly

to a new collective agreement code. According to our analysis, agreement turnover was particularly high in 2004, when employment law allowed for the unilateral revocation of collective agreements, and in 2012, when the administrative extensions of agreements were restricted (Hijzen and Martins, 2019).

procyclical real wages, in contrast to the literature on entry-level (not necessarily CB-based) wages.

This result of limited procyclicality is also consistent with our original eyeballing of the data in Table 1, by comparing mean modal wages over the 36-year period covered. However, this contrasts with the micro literature on real wage cyclicality, which finds significant evidence of procyclicality, including in the case of Portugal (Carneiro et al (2012) and Martins et al (2012)). Next, we investigate further this finding, regarding the specific and novel case of CB real wage cyclicality, by conducting several robustness checks and extensions.

In the next row of Table 2, we use ordinary least squares instead of weighted least squares. The resulting coefficient estimate, -0.44 (with estimated standard error 0.10), is larger and more precise than the weighted result. However, the implied procyclicality in this specification is still much lower than that found in other longitudinal studies.

In the third row, we consider only those agreement/job pairs that pay below median wages, in which the reference median is computed across all modal wages in each year. This represents a subset of CB that may be closer to the entry wages in 'ports of entry' that are more relevant from the perspective of the macroeconomic debate discussed in the Introduction. We find again, as in the first row, a very small and statistically insignificant coefficient (0.04, with a standard error of 0.24).

In the next three rows, we redo the regression from row 1 except that we consider alternative wage measures: the average base wage, the average total wage, and the modal hourly wage. We find in all cases statistically significant coefficients, ranging between -0.53 and -0.70. These point estimates are all higher (in absolute terms) than the previous

cases with significant estimates but still lower (by half or more) than the existing cyclicality estimates using longitudinal data.

In row 7 we consider a different approach towards the weighting of the data, not based on the total number of workers in each agreement/job pair but considering instead the number of workers that is actually paid the modal wage in each observation. Again, we find an insignificant coefficient of 0.07 (standard error of 0.19).

All the figures above contrast considerably with those of Martins et al (2012), in which real wage cyclicality was found to be at around -1.8 (row 8). In order to compare as closely as possible that figure under the present methodology focused on CB wages, we redo our analysis of row 1 but considering only the same time period as in Martins et al (2012). Row 9 presents a coefficient of 0.74 (standard error 0.31), indicating that our focus on CB wages, as opposed to the more specific subset of entry wages, cuts the degree of cyclicality in half.[9]

Of course, "cyclical upgrading" may underestimate procyclicality: if, in a recession, employers recruit a higher quality of workers at any given wage, the effective wage they pay per efficiency unit of labour is lower. This process is likely to apply in CB as well and we see no reason why it could be strong or differentiated enough to explain the big difference in cyclicality that we present here.

Finally, we revisit the macroeconomic regime change mentioned in the Introduction. Portugal and other Southern European countries underwent a significant change in their macroeconomic context in the run up to Eurozone membership, involving a steep decrease in inflation and increasingly more stable exchange rates. To what extent

[9] For the sake of completeness, we also estimate CB cyclicality for the remaining period of 2009-2017, in which we find nearly the same estimates as in the earlier period (row 10 of Table 3).

did CB cyclicality evolve and adjust as this macroeconomic regime adapted? We shed light on this question by running our main specification separately for the period before and after this regime change. We choose 1992 as the threshold year, based on Braga de Macedo (2001).

Our findings are striking: when considering the 1982-1992 period (row 11), we estimate a very high degree of procyclicality, with a coefficient of -5.17. Given that the standard error is 2.73, the coefficient is not extremely precise even if still significant at the 10% level. On the other hand, when considering the remaining period (1993-2017; row 12), we find again very small and insignificant cyclicality effects, in this case with a coefficient of -0.23 (standard error 0.10). These results indicate that CB real wage cyclicality decreased dramatically as the macroeconomic regime of Portugal changed from high inflation, high interest rates and high government deficits, under the frequent devaluation of the then national currency ('crawling-peg' system), as described in Braga de Macedo (1990), towards the very opposite context, along all these dimensions, in the run up to the Euro and during Euro membership.

## IV. Summary and Discussion

Collective bargaining conducted by trade unions and employer associations (the social partners) can play a key role in the formation of wages in many countries, with potentially significant interactions with the macroeconomy. In this paper, we quantified for the first time the business cycle sensitivity of the many minimum wages set in collective bargaining in a country. Our analysis is based on matched worker- and collective-

agreement data covering all private-sector employees in Portugal over the 1982-2017 period.

Our first main result is that, in contrast to the literature focused on the longitudinal analysis of individual wages, CB real wages appear to be largely acyclical. Indeed, we find that, on average, CB wages are no more than 0.7 percent lower when the unemployment rate increases by one percentage point. This is less than half the entry-level effect (1.8) documented in Martins et al (2012). The same comparison result also applies when restricting our CB sample period to match that of Martins et al (2012), 1982-2008, and in several robustness checks.

We also find that much of the sensitivity of collective bargaining wages is driven by the high-inflation period in Portugal, until 1992, in which CB real wage effects are as high as 5.2. As the economy changed its regime to prepare and then join the Eurozone, with radically lower inflation rates, CB real wage cyclicality diminished dramatically. In other words, the ability of CB wages to adjust to the business cycle nearly disappeared, which may have increased the sensitivity and volatility of employment and unemployment. In particular, this may explain, at least in part, the large response of unemployment to the 2011-2014 crisis, at least up to 2013, when the unemployment rate exceeded 16%.

These findings suggest that collective bargaining in Portugal has not adjusted to the macroeconomic regime change associated to Eurozone membership. As soon as inflation stopped 'greasing the wheels' of the labour market, CB real wages stopped or nearly stopped responding to the business cycle, which may have aggravated the employment consequences of that same business cycle (Schmitt-Grohé and Uribe, 2013). Of course, not all workers are paid the CB wages (on average, in our data, around 25% are paid the modal

value of their agreement/job pair), something which will restrict the relevance of CB wages. On the other hand, these workers that are paid CB wages will typically be less skilled individuals, that have joined their firms more recently, and that are employed under fixed-term contracts, all dimensions will already make them more vulnerable to the business cycle.

As stated in Martins et al (2012), "[the literature] requires not a theory of wage *rigidity*, but a theory of why wages are not even more variable than they are." Our results from longitudinal population micro data indicate that collective bargaining may be part of such theory, at least in some countries. Most of the procyclicality documented earlier will be driven by the 'wage cushion' between actual wages and CB wages, while CB wages are largely acyclical, at least in periods of low inflation. We hope that the simple methodology presented in this paper will be applied to additional countries. Further evidence would be particularly interesting from countries in which social partners have operated under a low-inflation environment for a longer period of time and or face greater flexibility to accommodate working conditions to the evolving business cycle.

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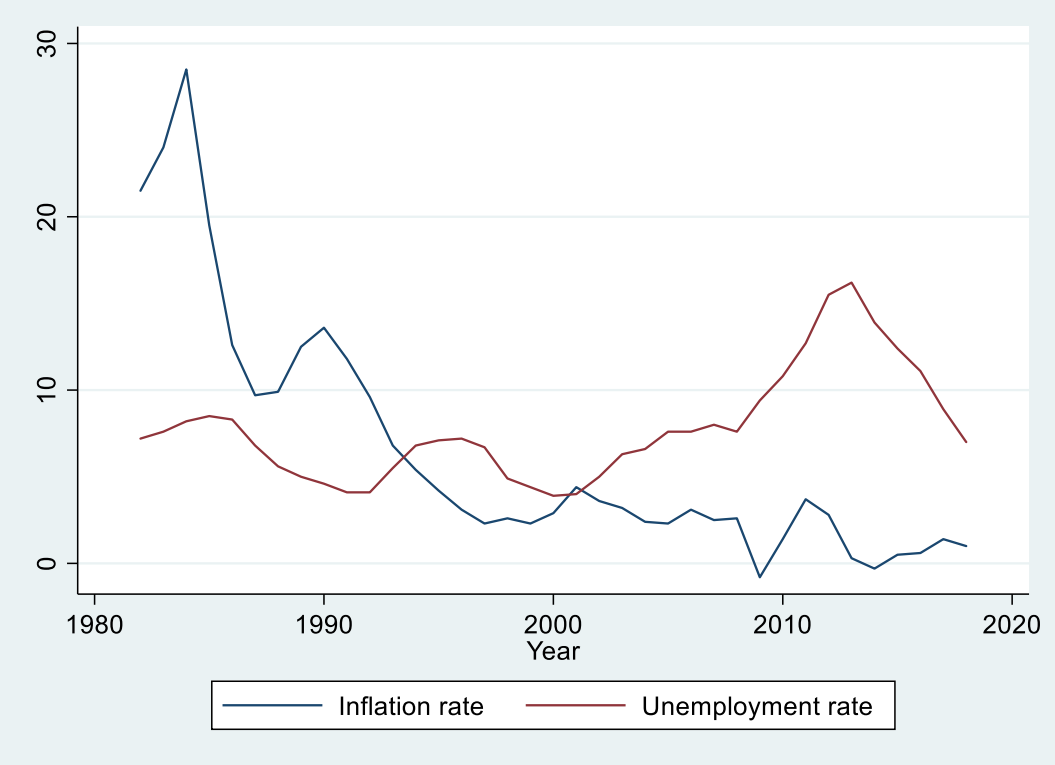
Figure 1. Annual Unemployment and Inflation Rates in Portugal, 1982-2018




Source: Statistics Portugal (INE) and Pordata.

Table 1. Sample Sizes and Average Weighted Salaries by Year

| Year | N. Workers | Nominal | Real Salary | Modal real |
|---|---|---|---|---|
| 1982 | 1538917 | 85.1 | 864.9 | 812.9 |
| 1983 | 1550507 | 101.0 | 780.1 | 739.9 |
| 1984 | 1334338 | 123.6 | 682.6 | 645.2 |
| 1986 | 1506146 | 176.1 | 684.5 | 641.5 |
| 1987 | 1543241 | 203.3 | 713.2 | 671.8 |
| 1988 | 1597997 | 223.4 | 706.3 | 657.5 |
| 1989 | 1737154 | 252.5 | 698.5 | 634.0 |
| 1991 | 1760303 | 346.1 | 729.7 | 649.2 |
| 1992 | 1796795 | 396.0 | 754.7 | 664.6 |
| 1993 | 1757991 | 439.5 | 780.6 | 671.9 |
| 1994 | 1753774 | 473.9 | 796.2 | 671.1 |
| 1995 | 1779220 | 489.2 | 787.6 | 665.6 |
| 1996 | 1777333 | 518.7 | 809.1 | 678.1 |
| 1997 | 1908168 | 529.4 | 806.8 | 664.0 |
| 1998 | 1935118 | 559.5 | 830.5 | 687.9 |
| 1999 | 2035372 | 579.8 | 840.8 | 681.5 |
| 2000 | 2105047 | 604.0 | 850.5 | 687.4 |
| 2002 | 2199269 | 668.7 | 867.8 | 693.8 |
| 2003 | 2239089 | 689.3 | 865.9 | 685.0 |
| 2004 | 2285091 | 714.7 | 876.2 | 681.4 |
| 2005 | 2407842 | 741.4 | 888.1 | 668.5 |
| 2006 | 2440077 | 762.4 | 885.0 | 666.3 |
| 2007 | 2498262 | 780.9 | 883.8 | 661.1 |
| 2008 | 2541942 | 816.0 | 899.5 | 671.4 |
| 2009 | 2412114 | 843.8 | 937.5 | 699.2 |
| 2010 | 2307517 | 872.5 | 955.8 | 716.5 |
| 2011 | 2267542 | 880.7 | 929.2 | 697.1 |
| 2012 | 2114102 | 891.9 | 914.6 | 682.7 |
| 2013 | 2262414 | 873.1 | 892.6 | 675.0 |
| 2014 | 2315508 | 876.8 | 899.1 | 677.9 |
| 2015 | 2206253 | 890.5 | 908.5 | 686.9 |
| 2016 | 2283859 | 901.6 | 914.5 | 694.7 |
| 2017 | 2379251 | 918.4 | 918.4 | 703.2 |

Notes: N. Workers indicates the number of individuals (full-time workers) considered in the analysis of each year; Nominal salary is the value in euros of each year of the mean base salary paid in the country; Real salary is the real version of the previous column (considering 2017 prices); Modal real salary is our measure of the (real) minimum wages set by collective agreement/job level pairs (weighted by the number of workers under each agreement/job pair). Source: Author's analysis based on the 'Quadros de Pessoal' data set.

Table 2. Number of Agreement/Jobs by Year and their Fit

| Year | N. Agreements/ Jobtitles | % (salary) base equal to mode | % (salary) total equal to mode |
|---|---|---|---|
| 1982 | 26,532 | 0.31 | 0.14 |
| 1983 | 27,367 | 0.31 | 0.14 |
| 1984 | 26,288 | 0.32 | 0.14 |
| 1986 | 28,248 | 0.33 | 0.16 |
| 1987 | 28,696 | 0.32 | 0.16 |
| 1988 | 28,543 | 0.29 | 0.15 |
| 1989 | 29,969 | 0.28 | 0.15 |
| 1991 | 29,848 | 0.28 | 0.13 |
| 1992 | 29,681 | 0.25 | 0.11 |
| 1993 | 29,390 | 0.23 | 0.10 |
| 1994 | 30,146 | 0.25 | 0.12 |
| 1995 | 30,886 | 0.29 | 0.13 |
| 1996 | 30,561 | 0.28 | 0.13 |
| 1997 | 30,519 | 0.27 | 0.12 |
| 1998 | 30,219 | 0.27 | 0.12 |
| 1999 | 29,730 | 0.27 | 0.12 |
| 2000 | 29,285 | 0.25 | 0.11 |
| 2002 | 28,456 | 0.21 | 0.09 |
| 2003 | 29,072 | 0.22 | 0.09 |
| 2004 | 29,559 | 0.21 | 0.09 |
| 2005 | 29,178 | 0.21 | 0.09 |
| 2006 | 28,570 | 0.19 | 0.08 |
| 2007 | 28,679 | 0.21 | 0.09 |
| 2008 | 28,868 | 0.21 | 0.09 |
| 2009 | 28,082 | 0.23 | 0.10 |
| 2010 | 28,156 | 0.23 | 0.08 |
| 2011 | 28,088 | 0.30 | 0.15 |
| 2012 | 33,947 | 0.30 | 0.16 |
| 2013 | 34,654 | 0.22 | 0.08 |
| 2014 | 34,963 | 0.26 | 0.09 |
| 2015 | 35,196 | 0.32 | 0.16 |
| 2016 | 35,640 | 0.34 | 0.16 |
| 2017 | 35,262 | 0.34 | 0.16 |

Notes: N. agreements/jobtitles indicates the number of different jobtitles across agreements available in the collective agreements applicable in each year; % base equal to mode indicates the percentage of workers that are paid a base wage equal to the model base wage of their agreement/jobtitle pair; % total equal to mode indicates the percentage of workers that are paid a total wage equal to the model total wage of their agreement/jobtitle pair (weighted statistics). Source: Author's analysis based on the 'Quadros de Pessoal' data set.

Table 3. Estimates of the Cyclicality of Log Collective Bargaining Wages

| Estimation Method and Sample | Estimated Unemployment Rate Coefficient (and Standard Error) |
|---|---|
| 1. Log modal monthly wage weighted regression, including linear trend, 1982-2017 | -0.15<br>(0.13) |
| 2. Same as (1) but (unweighted) ordinary least squares | -0.44<br>(0.10) |
| 3. Same as (1) for low-wage (below annual median) job levels | 0.03<br>(0.24) |
| 4. Same as (1) with log average base wage | -0.53<br>(0.16) |
| 5. Same as (1) with log average total wage | -0.67<br>(0.22) |
| 6. Same as (1) with log modal hourly wage | -0.70<br>(0.27) |
| 7. Same as (1) with weights corresponding to the number of workers paid the modal value | -0.07<br>(0.19) |
| 8. Closest specification to (1) in Martins et al (2012) [row 1 in Table 2, page 46] | -1.81<br>(0.38) |
| 9. Same as (1) for 1982-2008 | -0.74<br>(0.31) |
| 10. Same as (1) for 2009-2017 | -0.72<br>(0.14) |
| 11. Same as (1) for 1982-1992 | -5.17<br>(2.73) |
| 12. Same as (1) for 1993-2017 | -0.23<br>(0.10) |

Notes: Each coefficient corresponds to a different wage regression, based on a different specification and or a different sample. Weights correspond to the number of workers in each agreement/jobtitle (regardless of whether they are paid at the modal level). All specifications except 3 and 8-12 draw on 937,397 observations, each corresponding to an agreement/jobtitle pair in a given year over the period 1982-2017. All specifications control for up to 158,872 agreement/jobtitle fixed effects. Clustering of standard errors by year. All coefficients are significant at the 5% level except those of specifications 1, 7 and 11. Specification 11 is significant at the 10% level. Source: Author's analysis based on the 'Quadros de Pessoal' data.